



HF120/60HPPWV PowerPlusTM

High Frequency Portable X-ray Unit

Installation and Operating Instruction

Version 1.1

This special purpose portable equipment is for diagnostic radiography only.
It is not designed, nor does it meet, the standards for any other use.

Caution:

Federal law restricts this device to sale by or on the order of a
licensed physician.

MinXray, Inc.

3611 Commercial Avenue
Northbrook, Illinois 60062-1822
U.S.A.

Tel. 1-847-564-0323
Toll Free Tel: 1-800-221-2245 (U.S. and Canada)
Fax: 1-847-564-9040
E-mail: service@minxray.com
www.minxray.com

TABLE OF CONTENTS

Introduction	1
Certifications	2
Recordkeeping Requirements	3
Components	5
Main Parts	6
Warning statements, figures and symbols	8
Installation Instructions	
Unpacking	9
Assembly Instructions	9
Pre-Operational Required Testing	10
Installation Check list	14
Operating Instructions	
Operation	15
Safety Precautions	17
Maintenance	17
Specifications	19
Schematic Diagram	21
X-ray Tube	22

INTRODUCTION

The MinXray model *HF120/60HPPWV PowerPlus™* is a mono-block type high frequency portable x-ray unit. The *HF120/60HPPWV PowerPlus™* can be used with conventional diagnostic film or with solid-state digital radiographic sensors. It is supplied with the x-ray tubehead/collimator, detachable AC power cord, and detachable exposure cord with 2-stage exposure switch. The MinXray *HF120/60HPPWV PowerPlus™* high frequency diagnostic x-ray unit is designed for use with the MinXray model XGS MKIV LW or equivalent stand capable of providing secure, stable support that allows for proper positioning of the x-ray unit for radiographic imaging.

CARELESS OR IMPROPER USE OF X-RAY EQUIPMENT CAN BE EXTREMELY HAZARDOUS.

It is imperative that this equipment be operated and serviced only by trained personnel familiar with the safety precautions required to prevent excessive exposure to primary X-ray radiation, the dangers of exposure to X-ray radiation, and the proper use of the equipment discussed in this manual.

All personnel authorized to operate or service this equipment should be fully acquainted with the established maximum permissible doses, safety recommendations, and procedures derived from the following sources:

- A. National Council on Radiation Protection Report No.33 (Medical X-Ray and Gamma Ray Protection for Energies up to 10 MEV - Equipment Design and Use); from NRC Publications; P.O. Box 30175, Washington, D.C. 20014.
- B. National Bureau of Standards Handbook No.76 (Medical X-Ray Protection up to Three Million Volts); from the Superintendent of Documents, Government Printing Office, Washington, D.C. 20401.
- C. All documents relating to the Performance Standard for Diagnostic X-Ray Systems, 21 CFR Subchapter J, Part 1020; obtainable from FDA Center for Devices and Radiological Health, Department of HHS, 2098 Gaither Road, Rockville, MD 20850.
- D. State and local regulations governing radiation protection and the use of diagnostic X-ray equipment.
- E. Requirements of the user's in-house radiation protection program.
- F. Instructions and precautionary notices of this manual.

Although this equipment incorporates protective design features for limiting both the direct (primary) x-ray beam and the secondary radiation produced by this beam, design factors alone cannot prevent human carelessness, negligence, or lack of knowledge. This apparatus is sold with the understanding that the user assumes sole responsibility for radiation safety and that MinXray, Inc., its agents and representatives and do not accept responsibility for:

- A. Injury or danger to patient or other personnel from x-ray exposure.
- B. Overexposure due to poor operating techniques or procedures.
- C. Equipment not properly serviced or maintained in accordance with this manual.
- D. Equipment which has been modified or tampered with in any way.
- E. Equipment that has been connected to input voltage other than the voltage specified on the rating label affixed to the x-ray unit.

CERTIFICATIONS

THIS PRODUCT CONFORMS TO ALL APPLICABLE DHHS RADIATION STANDARDS OF 21 CFR SUBCHAPTER J AS OF THE DATE OF MANUFACTURE
--

RECORD KEEPING REQUIREMENTS

1. Dealer and Distributor Records

- a. Dealers and distributors of x-ray equipment shall obtain and preserve for a period of five years from the date of sale, award, or lease of each such product, such information as is necessary to permit tracing of specific products to specific purchasers.
- b. Such information shall include:
 - 1) The name and mailing address of distributor, dealer, or purchaser to whom the product was transferred.
 - 2) Identification and brand name of the product.
 - 3) Model number and serial or other identification number of the product.
 - 4) Date of sale, award or lease.

2. Records to be furnished to MinXray, Inc. by Dealers and Distributors

The information required in "1" above shall immediately be forwarded to MinXray unless:

- a. The dealer or distributor elects to hold and preserve such information, and to immediately furnish it to MinXray, Inc. when advised by MinXray or Director, Department of Health and Human Services, that such information is required for purposes of Section 359 of the Radiation Control for Health and Safety Act of 1968.
- b. The dealer or distributor, upon making the election under "a" above of this section, promptly notifies MinXray and the Center for Devices and Radiological Health of such election. Such notification shall be in writing and shall identify the dealer or distributor and the type of equipment for which the information is being accumulated.

3. Assembler's Report

All assemblers who install certified components should file a report of such assembly. All assembler's reports shall be on Form FD-2579, which is prescribed by and available from the Director, FDA/Department of Health and Human Services, Division of Compliance, 1390 Piccard Drive, Rockville, Maryland 20850. The original of Form FD-2579 shall be sent to the Director and copies to the purchaser, State Agency responsible for radiation protection, and one kept by the assembler for a period of least 5 years.

TO: ALL MANUFACTURERS AND ASSEMBLERS OF DIAGNOSTIC X-RAY EQUIPMENT

SUBJECT : Final Testing of Diagnostic X-ray Systems and Components Following Assembly

This letter is intended to establish HHS policy relative to final testing of a newly-assembled x-ray system or component before release to the user.

Manufacturer Responsibility - The FDA believes that plant-based manufacturers must include in their assembly instructions a specific requirement that the assembler perform a test(s) for the applicable requirements of the FDA performance standard at the time of installation. A thorough explanation of the equipment required and step-by-step instructions must be provided by the component or system manufacturer. The instructions should include a requirement to record key data to demonstrate at a later date that all tests were performed and that the equipment was left in full compliance with the standard. The FDA's Department of Health and Human Services will insure that these assembler test instructions are provided through a close review of the information submitted by manufacturers in initial, model change and annual reports. Plant-based manufacturers who do not include a final compliance test in their assembler instructions could be subject to disapproval of their quality control and testing program.

Assembler Responsibility - Assemblers of diagnostic x-ray equipment must perform a test or tests for the applicable requirements of the FDA performance standard at the time of installation if specified in the assembly instructions provided by the component or system manufacturer. Assemblers who do not perform and document such final compliance tests will be considered by the FDA to have issued a false and misleading certification and will, therefore, be subject to regulatory action by the Agency.

Should they be any questions concerning this Bureau policy please call X-ray Products Branch at 301-594-4591.

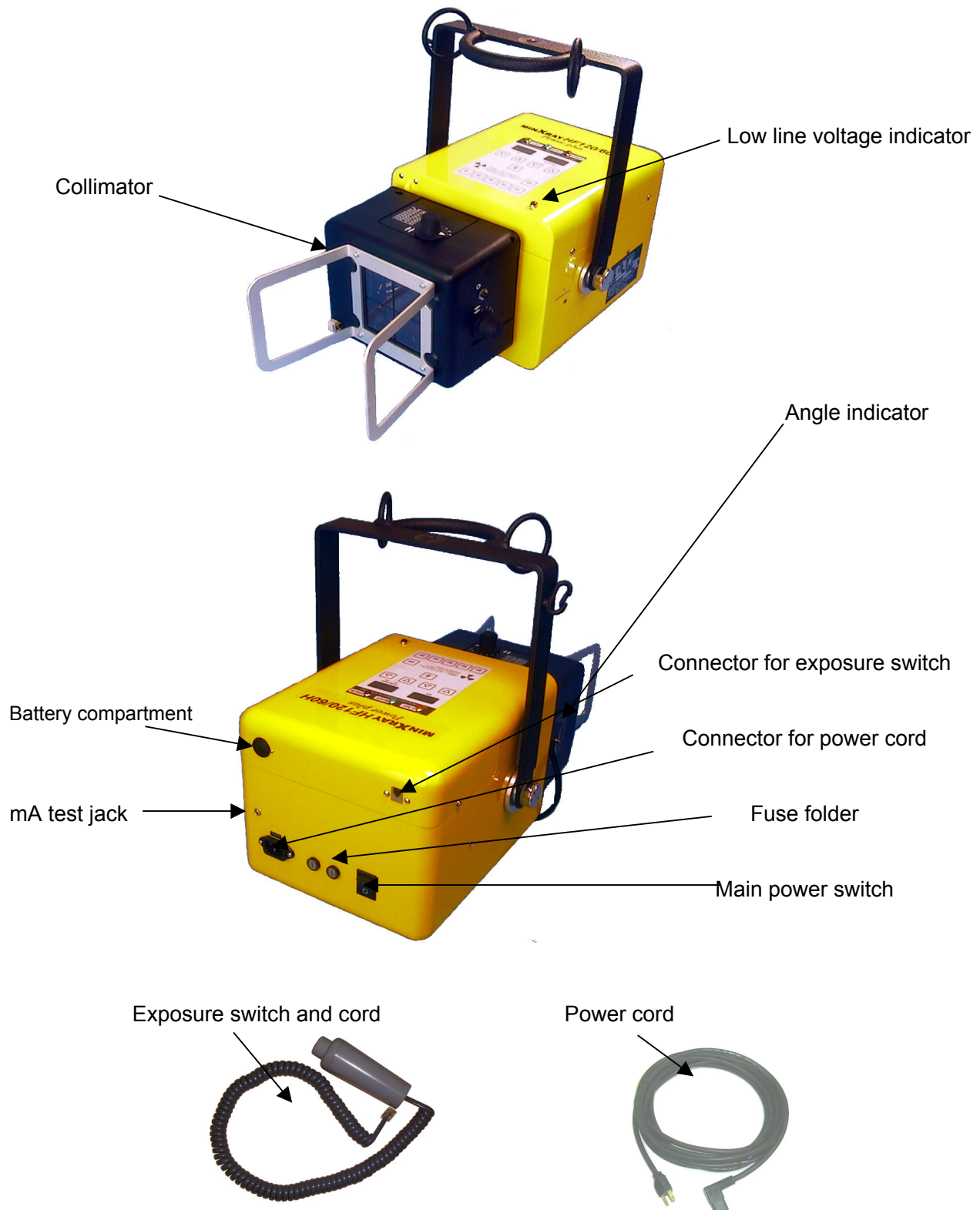
COMPONENTS

1. X-ray Unit (Model <i>HF120/60HPPWV PowerPlus™</i>)	1 set
2. Power cord	1 pc.
3. Hand-held Exposure Switch and Cord	1 pc.
4. Instruction Manual	1 pc.

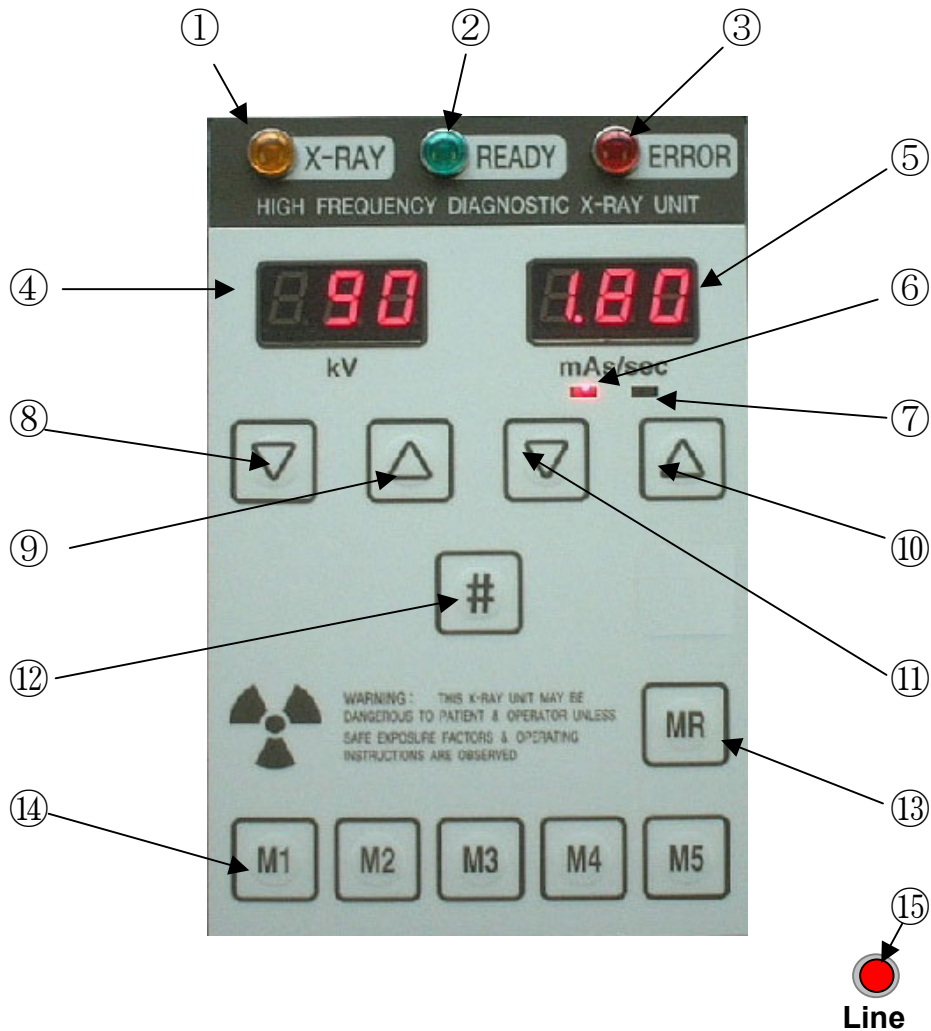
OPTIONAL COMPONENTS

Portable stand (Model XGS MKIV LW or equivalent)
System Transport Case (Model HF100HSTC)
Carrying case (Model HF120/60HCC)

MAIN PARTS OF MinXray HF120/60HPPWV PowerPlus™



CONTROL PANEL



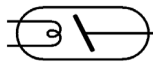
- | | |
|-------------------------------------|-------------------------------------|
| 1 X-ray Indicator | 8 kV Adjustment Button (-) |
| 2 Ready Indicator | 9 kV Adjustment Button (+) |
| 3 Error Indicator | 10 sec/mAs Adjustment Button (+) |
| 4 kV Indicator | 11 sec/mAs Adjustment Button (-) |
| 5 Exposure timer(sec)/mAs Indicator | 12 Shift Button |
| 6 mAs Indicator | 13 Memory Storage Button |
| 7 sec Indicator | 14 Memory Recall Buttons (M1 to M5) |
| | 15 Low line voltage indicator |

※Low line voltage indicator illuminates when line voltage is less than 90V during the X-ray exposure.

Warning Statements, Figures and Symbols

WARNING: THIS X-RAY UNIT MAY BE DANGEROUS TO PATIENT & OPERATOR UNLESS SAFE EXPOSURE FACTORS & OPERATING INSTRUCTIONS ARE OBSERVED

DANGER: HIGH VOLTAGE.
NO USER SERVICEABLE COMPONENTS INSIDE. REFER SERVICE TO QUALIFIED SERVICE TECHNICIAN. FOR CONTINUED PROTECTION AGAINST HAZARDOUS CONDITION, REPLACE FUSE WITH SAME TYPE AND RATING ONLY.



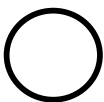
ANODE Anode direction



Radiation warning symbol



Main power on



Main power off



Attention, consult ACCOMPANYING DOCUMENTS

MinXray HF120/60HPPWV PowerPlus™
INSTALLATION INSTRUCTIONS

Unpacking

The MinXray HF120/60HPPWV PowerPlus™ consists of an X-ray generator (tubehead/control), continuously adjustable light beam collimator, mounting trunnion, exposure cord with 2-stage exposure switch, and AC power cord.

If a stand is purchased with the HF120/60HPPWV PowerPlus™, such as the MinXray XGS series of gas spring portable mobile stands, instructions for assembly of the stand and the attachment of the HF120/60HPPWV PowerPlus™ are included with the stand.

This equipment was shipped in perfect condition. When the equipment is received, each shipping container should be carefully examined for any evidence of mishandling during shipment. Note its condition; if abnormal, carefully unpack all parts and examine for damage. If any damage is noted, immediately report it to the carrier in the proper manner by personally calling it to attention by phone where possible, and filing a written report. Save all packing material for inspection by the carrier. If this equipment arrives with any damage, it is your responsibility to report to the carrier and file a claim.

All printed matter supplied with the HF120/60HPPWV PowerPlus™ and the XGS series stand should be saved for reference during installation and operation.

Assembly Instructions

Attach the HF120/60HPPWV PowerPlus™ to a stand designed or suitable for use with this x-ray unit, according to the instructions provided with the stand. The MinXray XGS series of gas spring portable mobile stands is designed specifically for use with the HF120/60HPPWV PowerPlus™ x-ray unit. Once the HF120/60HPPWV PowerPlus™ is properly attached to the model XGS stand, it can remain attached for use and transport.

1. Connect the AC power cord to the socket on the back of the HF120/60HPPWV PowerPlus™. Note the rated voltage of the HF120/60HPPWV PowerPlus™ before



2. Connect the exposure cord to the RJ11 telephone-type socket on the back of the HF120/60HPPWV PowerPlus™.

PRE-OPERATIONAL REQUIRED TESTING

The following test is the responsibility of the dealer or qualified end user technical personnel and must be conducted without fail. Fill out the checklist for this report when installation of x-ray unit is complete.

1. EXPOSURE TIMER

1-1. Test method:

1. Set *HF120/60HPPWV PowerPlus™* exposure timer to 0.01 sec.
2. Set *HF120/60HPPWV PowerPlus™* output to 120 kV.
3. Set NERO to the following settings.
SID: 18 inches; Wheel range: 100 ~ 150 kV; Sensitivity: Low; Phase select: 1Ø;
Measurement mode: STAT; X-ray values: 120 kV, 0.01 sec.
4. Make exposure and read the measured value of exposure time on the NERO.
5. Measure value of exposure time at following settings with same procedure: 0.01, 0.02, 0.04, 0.10, 0.20, 0.50, and 1.00 sec.

1-2. Instruments:

NERO Model 6000M x-ray beam analyzer
Manufactured by Victoreen, Inc. or equivalent

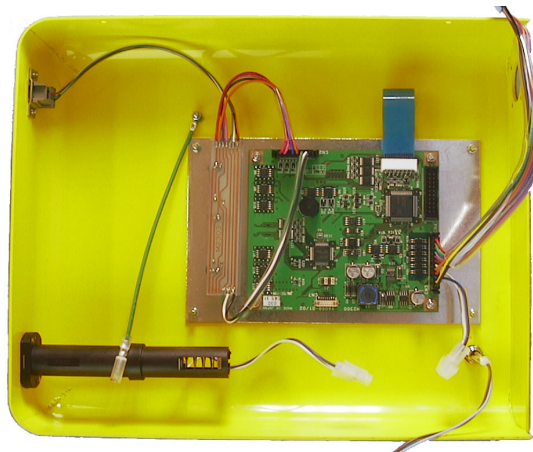
1-3. Rejection limit:

±10%+1 msec.

If the exposure time value exceeds the rejection limit, M2300 PC board needs replacement:

(1) remove the 4 screws on the side of the top cover of the *HF120/60HPPWV PowerPlus™*, and lift the top off of the body of the unit; (2) replace the M2300 PC board.

Fig.1



This measurement requires that an exposure be made. During the measurement, close the collimator shutters fully to block the primary X-ray.

2. PEAK TUBE POTENTIAL

2-1. Test method:

1. Set *HF120/60HPPWV PowerPlus™* exposure timer to 0.2 sec., and set kV to 40 kV.
2. Set NERO to the following settings:
SID: 18 inches; Wheel range: 30 ~ 60 kV; Sensitivity Hi; Phase select: 1Ø;
Measurement mode: SGL; Time delay 0.1 sec; X-ray values: 40 kV, 0.2 sec.
3. Make exposure and read the measured AVG. kV value on the NERO.
4. Measure also value of AVG. kV at 40 kV, 50 kV, 60 kV, 70 kV, 80 kV, 90 kV, 100kV, 110kV, 120 kV with same procedure.

2-2. Instruments:

NERO Model 6000M x-ray beam analyzer
Manufactured by Victoreen, Inc. or equivalent

2-3. Rejection limit:

±10%

If the peak tube potential needs adjustment: (1) remove the 4 screws on the side of the top cover of the *HF120/60HPPWV PowerPlus™*, and lift the top off of the body of the unit; (2) adjust the potentiometer "VR3" on the printed circuit board M9152 located on top of the lower portion of the unit (see Fig. 2) so that peak tube potential equals the indicated kV value, taking into consideration the accuracy tolerances; (3) replace the top cover and 4 screws.



This measurement requires that an exposure be made. During the measurement, close the collimator shutters fully to block the primary X-ray.

3. TUBE CURRENT

3-1. Test method :

3-1-1. mA at shorter exposure times

1. Set oscilloscope to the following settings:

ch 1:Ep, ch 2:Ip, ch1 V/div: 1V, ch2 V/div: 500 mV, sec/div: 25 msec, trigger level: ch1 1.5 V

Open the top cover of the *HF120/60HPPWV PowerPlus™* by removing the 4 screws and lifting the cover off of the unit. Connect ch 1 of oscilloscope to Ep pin of PC board M9152 and connect ch 2 of oscilloscope to Ip pin of PC board M9152. Connect GND line of probe to GND pin of PC board M9152.

2. Set *HF120/60HPPWV PowerPlus™* to 50 kV, and timer to 0.05 sec.

3. Make exposure, and measure Hi value of ch 2. 0.5 V is equal to 10 mA.

4. Measure also Hi value of ch2 at 60, 70, 80, 90, 100, 120kV with same procedure.

3-1-2. mA at longer exposure times

1. Set oscilloscope as the same as above procedure in 3-1-1. 1..

2. Set *HF120/60HPPWV PowerPlus™* to 50 kV, and timer to 0.2 sec.

3. Make exposure, and measure Hi value of ch 2. 0.5 V is equal to 10 mA.

4. Measure also Hi value of ch2 at 60, 70, 80, 90, 100, 120kV with same procedure.

3-1-3. Instruments:

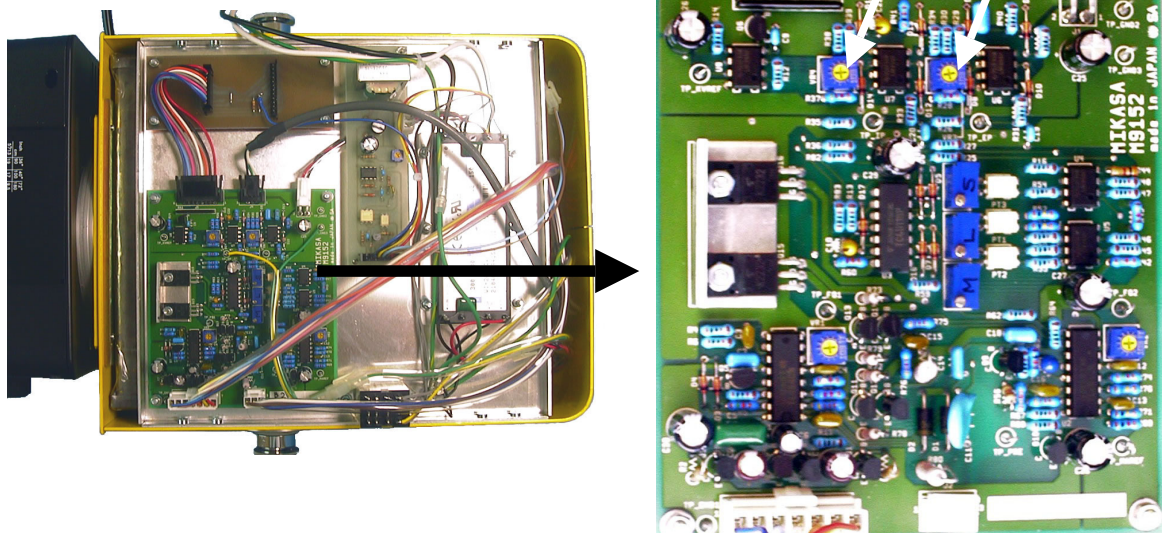
Instruments: Digital Storage & Analog Oscilloscope 2212

Manufactured by Tektronix Holland, N.V. or equivalent

3-1-4. Rejection limit: $\pm 20\%$

If the tube current needs adjustment: (1) adjust the potentiometer "VR4" on the printed circuit board M9152 (see Fig. 2) so that tube current equals 10 mA, taking into consideration the accuracy tolerances; (2) replace the top cover and 4 screws.

Fig.2



3-2. Measure mA by mA jack output:

mA Jack (Single round phone jack, 3.5 mm diameter) connection diagram



1. Close the collimator shutters fully.
2. Connect voltage measurement equipment (ex. Oscilloscope) with mA jack (Single round phone jack, 3.5mm/dm) to socket on the back of the *HF120/60HPPWV*
3. Make exposure.
4. Measure voltage of mA Jack 's output. (Single round phone jack,3.5 mm/dm)
5. Calculate the mA as follows : $20 \text{ mA} = 1.00 \text{ V}$



This measurement requires that an exposure be made. During the measurement, close the collimator shutters fully to block the primary X-ray.

**Note: Only voltage value can be measured from mA jack output.
mA jack 's output can be measured only during x-ray exposure.**

4. LIGHT FIELD TO X-RAY FIELD ALIGNMENT

Refer to Advantech collimator instruction manual for test method and adjustment procedure.

INSTALLATION CHECK LIST

INSTALLATION CHECK LIST		<i>HF120/60HPPWV PowerPlus™</i>	
	Fill out this checklist when installation is complete.	SERIAL NO.	
		DATE MANUFACTURED	
EQUIPMENT LOCATION			

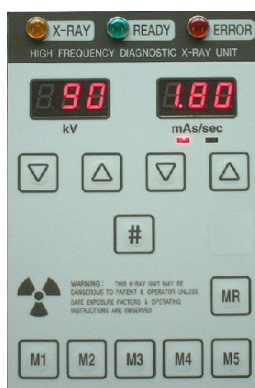
TEST DESCRIPTION	ACCEPTANCE LIMIT	RESULTS	CHECK	
Line Voltage	100~260V	V	☐ ☐ GO NO GO	
Line Voltage Regulation	4.80%	%	☐ ☐ GO NO GO	
Peak Tube Potential	40 kV±10%	kV	☐ ☐ GO NO GO	
	50 kV±10%	kV		
	60 kV±10%	kV		
	70 kV±10%	kV		
	80 kV±10%	kV		
	90 kV±10%	kV		
	100 kV±10%	kV		
	110 kV±10%	kV		
	120 kV±10%	kV		
Tube Current	60 / 42 mA±20% at 50kV	mA	☐ ☐ GO NO GO	
	50 / 35 mA±20% at 60kV	mA		
	45 / 31.5 mA±20% at 70kV	mA		
	38 / 26.6 mA±20% at 80kV	mA		
	33 / 23.1 mA±20% at 90kV	mA		
	30 / 21 mA±20% at 100kV	mA		
	30 / 21 mA±20% at 120kV	mA		
Exposure time	0.01 sec±10%+1 msec	sec	☐ ☐ GO NO GO	
	0.02 sec±10%+1 msec	sec		
	0.05 sec±10%+1 msec	sec		
	0.1 sec±10%+1 msec	sec		
	0.2 sec±10%+1 msec	sec		
	0.5 sec±10%+1 msec	sec		
	1 sec±10%+1 msec	sec		
All Mechanical Movement	Smooth Movement	/	☐ ☐ GO NO GO	
Light field to x-ray field alignment	See Collimator Operation Manual	/	☐ ☐ GO NO GO	
Instruments Used	Manufacturer	Model	Accuracy	Last calibrated
Dealer name		Dealers Phone Number		
Dealer Address				
Assembler signature			DATE	

OPERATION INSTRUCTIONS

IT IS ASSUMED BY THE DISTRIBUTORS AND MANUFACTURERS OF THIS EQUIPMENT THAT THE PERSON RESPONSIBLE FOR ITS OPERATION HAS A GENERAL KNOWLEDGE OF THE USE OF X-RAYS, INCLUDING THE SAFETY PRECAUTIONS THAT MUST BE TAKEN.

Operation

- 1.0 Make sure that the main power switch is OFF. Connect the AC power cord to a grounded electrical outlet. Check the label on the *HF120/60HPPWV PowerPlus™* for the correct AC input voltage and amperage required.
- 2.0 Turn on the main power switch on the *HF120/60HPPWV PowerPlus™*. The kV and sec LED displays will light and remain on. The *HF120/60HPPWV PowerPlus™* has internal circuitry to automatically compensate for variations in the input voltage to assure consistent kV and mA
- 3.0 Select the kV output by pressing the arrows below the kV display to choose 40 to 120 kV. mA output is selected automatically based upon the kV output selected.



- 4.0 Set the exposure time for the view to be taken, and the imaging medium used. Press the arrows below the sec. display to choose the exposure time between 0.01 and 5.0 second exposures. The display can be changed between mAs and sec. selected by pressing the shift switch (#) and pressing the down arrow (▽) below the kV display.
- 5.0 Use the retractable tape measure on the collimator to position the *HF120/60HPPWV PowerPlus™* at the proper source-image distance (SID) for the image to be taken.
- 6.0 Turn on the collimator light by pressing the button on the collimator. The light will remain on for approximately 30 seconds, and then automatically turn off. The shutters of the collimator can be adjusted at any time with the 2 knobs on the collimator. The size of radiation field will only be projected on the image receptor when the light is on.
- 7.0 Position the patient. Adjust the collimator position so the cross hair projected by the collimator light is aligned with the anatomical point of interest and the center of the image receptor. Collimate the size of the light field so that it stays within the dimensions of the image receptor.

8.0 The exposure switch has 2-stage button.

The first stage pre-heats the filament of the x-ray tube. When this stage alone is depressed and held, " READY " indicator will light after 2.5 seconds, indicating the filament was heated and the unit is ready to generate x-rays.

The second stage initiates the x-ray exposure for the time set in the sec display. When the second stage is fully depressed, x-ray will be emitted, the X-RAY indicator will light, and an audible signal will be heard. PRESS AND HOLD THE FIRST AND SECOND STAGE BUTTONS TOGETHER UNTIL THE EXPOSURE HAS TERMINATED. This is a " dead man" exposure switch -- x-ray exposure will terminated immediately as a safety feature when the buttons are released.

It is possible to depress the two stage buttons simultaneously. When this is done, there is approximately a 2.5 second delay before the timed x-ray exposure begins.

- 9.0 After each exposure, release the exposure buttons. The *HF120/60HPPWV PowerPlus™* is now ready for the next exposure.
- 10.0 When you are finished using the *HF120/60HPPWV PowerPlus™*, turn off the main power switch, disconnect the AC power cord and exposure cord, and put the stand with the *HF120/60HPPWV PowerPlus™* attached into its correct configuration for transport.
- 11.0 Five different technique settings can be stored in memory for quick recall on the *HF120/60HPPWV PowerPlus™*. To store a technique setting, press the Memory Storage button MR then press Memory Recall button M1. This will store the technique setting displayed in memory position M1. Repeat this process for storing the different technique setting in M2-M5 as desired. Stored technique settings can be easily recalled by simply pressing M1-M5.
- 12.0 Memory Storage use two (2) size AA alkaline batteries inside Battery Compartment, located on the back side of equipment. Open the Battery Compartment using a coin, turning the compartment lid counterclockwise 90°. If there are no batteries in the Battery Compartment, use some adhesive tape to help you remove the compartment lid.

Insert two (2) size AA alkaline batteries in the Battery Compartment, with the + end toward the Battery Compartment lid. Reattach the Battery Compartment lid and lock it with a coin, turning it clockwise 90°.



※ Error lamp will blink if the exposure switch is released before the set exposure time. Turn off Main Power Switch and turn power on again to reset the equipment.

Safety Precautions

- 1.0 During exposure the operator must stand as far as possible from the patient being x-rayed, and should wear a lead apron or stand behind a lead shield.
- 2.0 The operator must not stand in the primary x-ray beam.
- 3.0 The operator should wear a monitoring dosimeter while operating this unit. It should be worn where it is not covered by a lead apron.
- 4.0 X-ray exposure should be kept as short as possible.
- 5.0 The presence of radio frequency (RF) or electromagnetic radiation may adversely affect the operation of this device. Please keep this equipment away from likely sources of RF radiation.

Maintenance

Clean the *HF120/60HPPWV PowerPlus™* as needed with a damp sponge or cloth and mild detergent.
The following must be checked before each use:

Tubehead

- 1.0 Make sure the certification and identification labels are in place.
- 2.0 Check for any loose or missing screws.
- 3.0 Check for oil leaks.
- 4.0 Check for any physical damage.
- 5.0 Check the kV adjustment for proper operation.
- 6.0 Check the timer for proper operation.
- 7.0 Check collimator shutters for proper operation.
- 8.0 Check collimator light bulb for proper operation.
- 9.0 Check all cords and cord connections.
- 10.0 Check the exposure buttons--the exposure must terminate if the button is released during an exposure.

Indicators

- 1.0 Check the X-RAY indicator for proper operation when both exposure buttons are depressed and held.
- 2.0 Make sure the audible signal operates during an exposure.
- 3.0 If the ERROR INDICATOR is on, it means the unit has malfunctioned and x-ray cannot be generated.

If ERROR INDICATOR is lit even after the EXPOSURE SWITCH is released, it means an unusual situation has occurred. Turn off the MAIN POWER SWITCH, wait 3 minutes, then start procedures over again.

If the ERROR INDICATOR remains on, contact your dealer or MinXray for service.

WARNING

Continued use of loose components is dangerous and could cause further loosening, damaged screws and bolts, or mount failure which could result in HEAVY COMPONENTS FALLING DURING USE. The operator should report all loose system components or any other problems to qualified service personnel for immediate repair.

The following must be checked every six (6) months:

- 1.0 Check the collimator light field to x-ray field alignment (refer to collimator instruction manual).
- 2.0 Check the kV output (refer to page 11 - Peak Tube Potential).
- 3.0 Check the mA output (refer to page 12 - Tube Current)
- 4.0 Check the timer accuracy (refer to page 10 - Exposure Time)

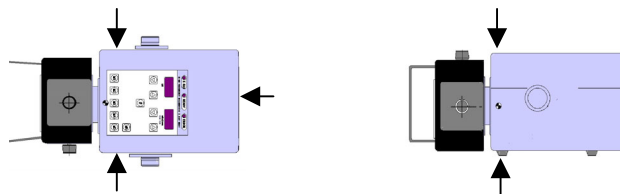
Have this unit checked by qualified x-ray service personnel immediately if any problems occur with the *HF120/60HPPWV PowerPlus™*. MinXray can supply detailed technical service and parts information to qualified service personnel upon request.

The following must be checked every two (2) years:

The *HF120/60HPPWV PowerPlus™* should be tested for Leakage Radiation by qualified personnel.

Test method:

1. Set *HF120/60HPPWV PowerPlus™* exposure timer to 1.0 sec., and set kV to 120 kV.
2. Set x-ray dosimeter to the following settings:
distance: 1m; range: 0 - 30 mR, ionization chamber: 350cm³
3. Position the ion chamber 1 meter from the tubehead at each of the points indicated by arrows below.
4. Close the collimator and make exposure.
5. Measure value of the mR.



Calculations: $\text{mR/h} = (\text{raw test data})\text{mR} \times 3600 / (\text{duty cycle})60$

Instruments: Model 37D Portable X-ray dosimeter Mfd. by D.A.Pitman or equivalent

Rejection limit: 20mR/h

MinXray can supply detailed technical service and parts information to qualified service personnel upon request.

MinXray HF120/60HPPWV PowerPlus™ SPECIFICATIONS

Rating

Line Voltage	AC, single-phase, 100-260V, 50/60Hz
Line voltage regulation	4.80%
Input current	Stand by: 0.165A Momentary: 29A
Maximum output power	120kVDC, 20mA
Protection against electrical shock	Type B, Class I
Mode of operation	Continuous operation with intermittent loading
Duty cycle	1 : 60 (1 sec. On, 60 sec. Off)
Degree of protection against the ingress of water	Ordinary
Degree of safety of application in the presence of a FLAMMABLE ANAESTHETIC MIXTURE WITH AIR or WITH OXYGEN OR NITROUS OXIDE	Equipment not suitable for use in the presence of a flammable anesthetic mixture with air or with oxygen or nitrous oxide
Fuse	30 A @ 125V

X-ray Generator

Output range	60 mA(0.01-0.1sec), 42 mA (0.11 – 5.0sec) @ 40 - 50 kVDC 50 mA(0.01-0.1sec), 35 mA (0.11 – 5.0sec) @ 52 - 60 kVDC 45 mA(0.01-0.1sec), 31.5 mA (0.11 – 5.0sec) @ 62 - 70 kVDC 38 mA(0.01-0.1sec), 26.6 mA (0.11 – 5.0sec) @ 72 - 80 kVDC 33 mA(0.01-0.1sec), 23.1 mA (0.11 – 5.0sec) @ 82 - 90 kVDC 30 mA(0.01-0.1sec), 21 mA (0.11 – 5.0sec) @ 92 - 100 kVDC 20 mA(0.01-0.1sec), 14 mA (0.11 – 5.0sec) @ 102 - 120 kVDC
Timer range	0.01-5.0 sec. , 82 total steps
Electric power	1.56 kW @ 120 kVDC , 14 mA
Maximum deviation from fixed factors	Tube potential $\pm 10\%$ Tube current $\pm 20\%$ Exposure time $\pm 10\% + 1$ msec
Leakage technique factors	0.22 mA @ 120kV 0.22 mA is maximum rated continuous current for 14 mA with duty cycle 1:60
Inherent filtration	2.2 mm Al equivalent
Total filtration	3.2 mm Al equivalent (with collimator)
High voltage circuit output	40 kHz high frequency inverter system with neutral ground circuit
Electromagnetic compatibility (EMC)	Complies with IEC60601-1-2, 1993

X-ray tube

Manufacturer	Superior X-ray Tube Company
Type	SXR-130-15-1.2
Focal Spot	1.2 mm
Anode heat storage	65 kHU

Collimator (Beam Limiting Device)

Manufacturer	Advantech Systems
Type	R72/32 or equivalent
Filtration	See collimator specifications

Dimensions and Accessories

Equipment	11.5" (29.2 cm) W x 8.81" (22.4 cm) H x 16.25" (41.3 cm) L
Weight	38.6 lbs (17.51 kgs.)
Exposure Switch	Two-stage, deadman with RJ11 connector
Exposure Cord	25 feet (7.6 m)
Detachable Power Cord	20 feet (6.1 m), Listed and CN, 16 AWG 3 conductor, TWO-POLE SOCKET- OUTLET WITH HOSPITAL GRADE PLUG WITH GROUND PIN
Stand	Fits MinXray XGS MKIV LW or equivalent

Environmental conditions for transport and storage

Ambient temperature range	-40°C~70°C
Relative humidity range (including condensation)	10%~100%
Atmospheric pressure range	500hPa~1060hPa

Environmental conditions for use

Ambient temperature range	10°C~40°C
Relative humidity range (including condensation)	30%~85%
Atmospheric pressure range	700hPa~1060hPa

Warm up procedure

It is imperative that this equipment should follow this warm up procedure after transport or storage under -30°C. The equipment should be operated only after 12 hours of warm up storage at 10°C~40°C. No exposure should be made during this warm up period.

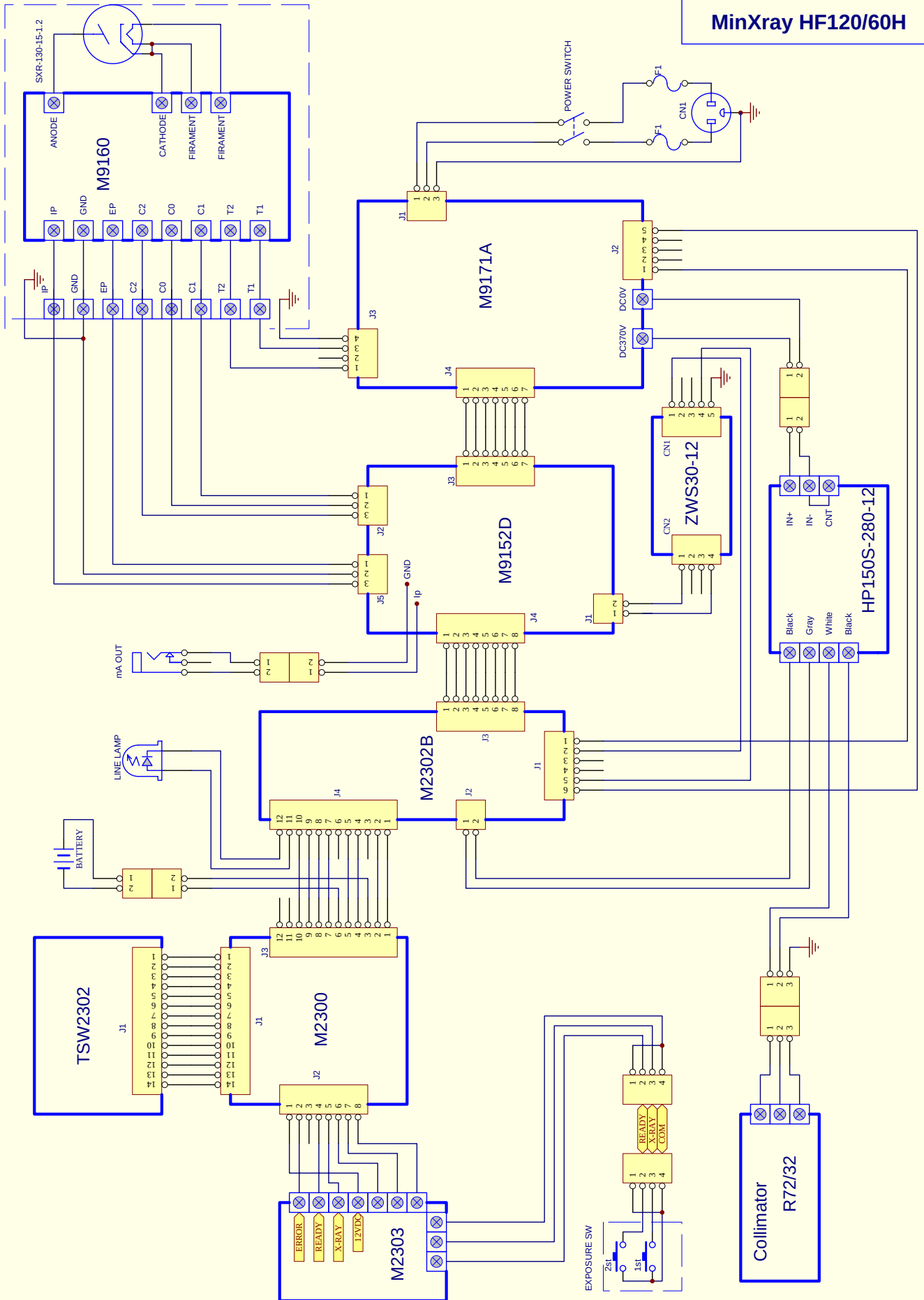
Cooling procedure

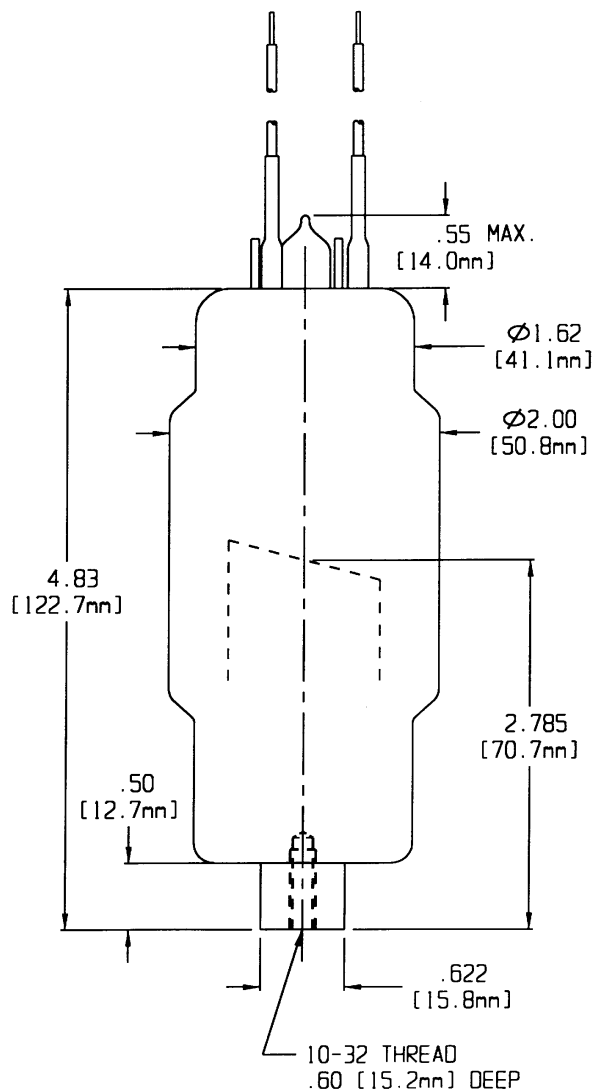
It is imperative that this equipment should follow this cooling procedure after transport or storage above 70°C. The equipment should be operated only after 12 hours of cooling storage at 10°C~40°C. No exposure should be made during this cooling period.

The MinXray *HF120/60HPPWV PowerPlus™* is compatible with all radiographic imaging modalities, including digital.

Specifications subject to revision without notice.

SCHEMATIC DIAGRAM MinXray HF120/60H





Operating Data

Available focal spot sizes (mm):

1.2

Beam Coverage:

14°

Anode construction:

Vacuum cast copper with tungsten target

Cathode construction:

Vacuum tube nickel with tungsten filament

Max. Tube operating voltage:

130 kVp Full wave rectified

Tube Current (mA):

Large spot 4.5mA continuous up to 50mA

Inherent filtration/Window material:

2.0 mm/Glass

Cooling Method:

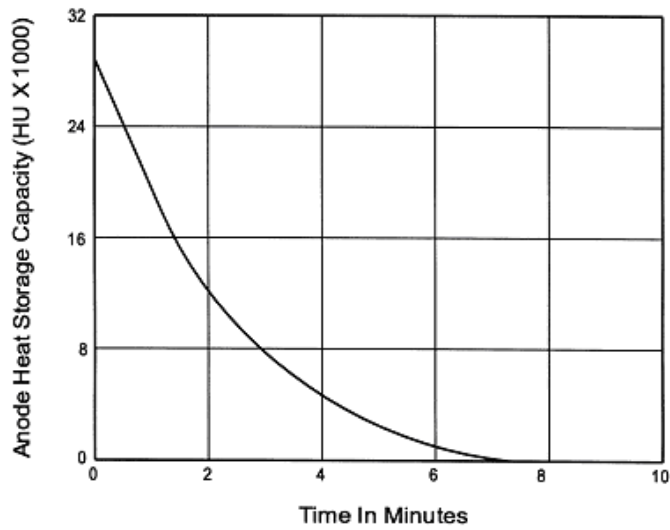
High dielectric transformer oil

SXR-130-15-1.2
1.2 FOCAL SPOT



ANODE COOLING CURVE

SUPERIOR X-RAY TUBE CO.



HF120/60H TUBE HOUSING COOLING CURVE

